a coil rigidly coupled to the display panel, the coil comprising a length of an electrically conducing wire wound in a coil and extending along an axis defining an axial direction, the coil comprising a first region having a first winding density and a second region having a second winding density higher than the first winding density, the second region at least partially extending into the air gap of the magnet assembly,

wherein a mass of the display panel and a mass of the coil in the second region form a coupled oscillator configured to provide a resonant mode at a frequency in a range from 5 kHz to 20 kHz.

2. The panel audio loudspeaker of claim **1**, wherein the first region extends in the axial direction from a first end of the coil that is coupled to the display panel to the magnet assembly.

3. The panel audio loudspeaker of claim **2**, wherein the second region extends in the axial direction in the air gap to a second end of the coil opposite the first end of the coil.

4. The panel audio loudspeaker of claim **1**, wherein the first region has a winding density lower compared to an average winding density of the coil and the second region has winding density higher than the average winding density.

5. The panel audio loudspeaker of claim **1**, wherein the first region has a minimum winding density that is 75% of or less than an average winding density of the coil.

6. The panel audio loudspeaker of claim **1**, wherein the second region has a maximum winding density that is 125% of or more than an average winding density of the coil.

7. The panel audio loudspeaker of claim **1**, wherein a winding density of the coil in the first region is substantially constant along the axial direction.

8. The panel audio loudspeaker of claim **1**, wherein a winding density of the coil in the first region varies along the axial direction.

9. The panel audio loudspeaker of claim **1**, wherein a winding density of the coil in the second region is substantially constant along the axial direction.

10. The panel audio loudspeaker of claim **1**, wherein a winding density of the coil in the second region varies along the axial direction.

11. The panel audio loudspeaker of claim **1**, wherein the coil has a greater mechanical compliance in the first region than the second region.

12. The panel audio loudspeaker of claim **1**, wherein the mass of the display panel and the mass of the coil in the second region form a coupled oscillator configured to provide a resonant mode at a frequency in a range from 8 kHz to 20 kHz.

13. The panel audio loudspeaker of claim **12**, wherein the mass of the display panel and the mass of the coil in the second region form a coupled oscillator configured to provide a resonant mode at a frequency in a range from 8 kHz to 10 kHz.

14. The panel audio loudspeaker of claim **12**, wherein the mass of the display panel and the mass of the coil in the second region form a coupled oscillator configured to provide a resonant mode at a frequency in a range from 10 kHz to 12 kHz.

15. The panel audio loudspeaker of claim **12**, wherein the mass of the display panel and the mass of the coil in the second region form a coupled oscillator configured to provide a resonant mode at a frequency in a range from 12 kHz to 15 kHz.

16. The panel audio loudspeaker of claim **12**, wherein the mass of the display panel and the mass of the coil in the second region form a coupled oscillator configured to provide a resonant mode at a frequency in a range from 15 kHz to 20 kHz.

17. The panel audio loudspeaker of claim **1**, further comprising a cap extending along the coil adjacent to the first region of the coil, the cap being bonded to a same surface as an end of the coil.

18. The panel audio loudspeaker of claim **17**, wherein the cap is a kapton or aluminum cap.

19. The panel audio loudspeaker of claim **17**, wherein a radial thickness of the cap and the first region of the coil is the same as or less than a radial thickness of the second region of the coil.

20. The panel audio loudspeaker of claim **19**, wherein the cap is positioned at an outer circumference of the coil.

21. The panel audio loudspeaker of claim **1**, wherein the magnet assembly is suspended from the display panel by one or more compliant members.

22. The panel audio loudspeaker of claim **1**, wherein the magnet assembly comprises a pole piece, the permanent magnet being positioned in the axial direction between the pole piece and a back plate of the cup, the air gap extending adjacent the pole piece.

23. The panel audio loudspeaker of claim **22**, wherein the second region is adjacent the pole piece in the axial direction.

24. The panel audio loudspeaker of claim **22**, wherein the pole piece comprises a soft magnetic material.

25. The panel audio loudspeaker of claim **1**, wherein the sidewalls of the cup comprise a portion comprising a permanent magnet material and a portion comprising a soft magnetic material.

26. The panel audio loudspeaker of claim **1**, further comprising a plate between the coil and the display panel, the plate being bonded on one side to the display panel and on an opposite side to the coil.

27. A mobile device or a wearable device, comprising:

a housing;

a display panel mounted in the housing;

an actuator coupling plate attached to the display panel;

a coil attached to the actuator coupling plate, the coil defining an axial direction and having a first region and a second region, the first region having a lower density of windings compared to the second region;

a magnet assembly comprising an inner portion and an outer portion separated from the inner portion by an air gap, the inner portion comprising permanent magnet extending within the magnet assembly along the axial direction, wherein the coil is arranged so that the second region is in the air gap; and

an electronic control module electrically coupled to the coil and programmed to energize the coil to cause axial motion of the magnet assembly relative to the coil such that the display panel vibrates at frequencies and amplitudes sufficient to produce an audio response from the display panel,

wherein a mass of the display panel and a mass of the coil in the second region form a coupled oscillator configured to provide a resonant mode at a frequency in a range from 5 kHz to 20 kHz.

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